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EDITORIAL NOTES

PRODUCER GAS FOR MOTOR TRANSPORT

ON April 28, following a debate in the House of Lords on March 11, there was a further debate on the use of producer gas for motor transport, when the Duke of Montrose moved that "a scheme for converting 50,000 transport vehicles to producer gas propulsion, with a view to saving 500,000 tons of petrol for the fighting services, shall be put into force as soon as possible." At the time the Minister of War Transport said that immediate action would be taken to equip as soon as practicable 10,000 commercial vehicles with the new design of Government emergency producer. The day following this announcement the Mobile Producer Gas Association met in London and urged the putting into operation of a scheme for converting 50,000 road vehicles to run on producer gas. The production capacity of the M.P.G. Association was then given as 120 plants a week—an output which, it was stated, could speedily be increased to 1,000 plants a month. Discussing the matter at the time ("JOURNAL" of May 6) we suggested that at the meeting of the Association the question of fuel supplies was discussed somewhat airily. "Where," we asked, "is the fuel?", adding our belief that the Gas Industry—*granted the availability of labour, plant, and raw material*—could easily produce large quantities of fuel suitable for gas producers. The proviso, important then, is even more important to-day; it is, in fact, at the root of the problem, however easy technically and however desirable from many other points of view the change-over from oil and petrol to producer gas may be. Obviously one looks to a solution of the problem.

We return to the matter in the light of a meeting of the Mobile Producer Gas Association held in London on July 16 (see last week's "JOURNAL," p. 165), and the debate in the House of Lords on July 22. At the recent meeting of the M.P.G. Association, a new scheme was put forward for equipping "at least 10,000 commercial and other vehicles on essential work" with producer gas plants within nine months. The scheme proposed that the existing manufacturers should expand production to their present full capacity of 200 plants per week, to be increased by the end of 12 weeks to 400 plants per week; other features concerned distribution, installation, and servicing of producer plants, and the training of men and women as drivers, and the plan contemplated the use of a wide range of fuels, including activated high temperature coke, low temperature coke, and charcoal. It was argued that a single design plan (such as, presumably, was that of the Government) would stifle the energetic research and development work now being carried on by the independent makers. This argument is sound enough. Normally, we think, the competitive element reacts favourably on progress; but the times are abnormal, and the Association's suggestions regarding fuel supplies do not seem to carry us very far.

Let us turn to the House of Lords Debate on July 22, when the Duke of Montrose moved to resolve that the scheme of April 28 for converting 50,000 transport vehicles to producer gas propulsion should be prepared and put into force as soon as possible. Referring to what he termed the Government's "boiled-down" scheme, he suggested that a plan envisaging only 10,000 producer gas units was really too small to bother about, that it would make no difference practically to the national position in the matter of oil, and was too small to justify the appointment of a special director and the creation of a special department. Turning to raw materials, he argued that with 25,000 tons of steel it would be possible to build only two small tankers, and that these would never carry all the oil which could be replaced if that amount of steel was used for the manufacture of producer plants; hence steel invested in producer plants instead of ships would be very well invested. As to fuel, he continued, why bother about anthracite? What about the carbonized fuels, fifteen times as great in quantity? And he appealed to the Minister of War Transport to give favourable consideration to co-operation with the Mobile Producer Gas Association and to take advantage of their knowledge and experience.

During the debate four points concerning producer gas equipment were made by Lord Sempill. First, on April 28 it was made clear that it was the Government emergency producer which was to be made. Secondly, on June 25, the producer referred to in the House of Commons was the Tillings producer —a producer different in important features of design from the Government emergency producer. Thirdly, what he called the Mark I Government producer was not a success. Fourthly, the latest type of Government emergency producer shows a considerable improvement, yet has a comparatively short experience of running mileage at the back of it when considered in comparison with the Tillings producer and the producer of the British Coal Utilization Research Association.

We come to the answers made by the Minister of War Transport, defining the Government's policy, so bringing the picture up to date and into relief, though not providing grounds for great elation among those interested in independent producer units and the production of producer fuels other than anthracite. Regarding the number of plants, the present decision rests at 10,000, and "it will be several months before anything like a large number of these plants can possibly be expected to be in operation." Two types of plant have been decided on, the Government's improved emergency producer and the Tillings improved Government apparatus. Of the latter, 2,500 have already been ordered; it was hoped to increase this to 5,000, leaving 5,000 of the Government's own producer. Most big manufacturers of goods vehicles, stated the Minister, are co-

operating, and have agreed in principle to arrange for the fitting and connexion of the plants. He made it quite clear that at the moment the bottle-neck is not a matter of steel supplies but a question of fuel supply. Regarding the fuel position, he said: "It is only anthracite, plus a little low-temperature coke, that can be made available. Substantially only anthracite is available to us for this purpose. . . . It is not possible for us to distribute over the country that selected gas coal to the somewhat limited number of gas-works that can retort that kind of coal so as to obtain the result that would be necessary. The coal is required for other destinations. Vital war work cannot be disturbed as it would be if there was a redistribution of that fuel. . . . I am restricted in the main to anthracite fuel."

To the foregoing gloomy statement the Minister of War Transport added that the fact that he confined production to the two types of producer mentioned, to make up the 10,000 programme, did not exclude other makers going ahead with their own plants, though we doubt whether the Mobile Producer Gas Association will have found excess of consolation and encouragement in his remarks concerning "other makers," which we will quote: "I do not think they will be able to do much, but I should like to feel that they were kept in action if for no other reason than that we should have the benefit of the experience which they will gain in this further experiment between now, say, and the end of the year. . . . I am not an advocate merely of the Government producer; I would like to see many others at work . . . but I have to face the realities of the situation." Since that statement was made the Government has decided that no vehicle, whatever fuel is used, shall be allowed to operate for purposes which would not justify an issue of motor spirit or diesel oil. This is to be effected by two Orders under the Defence Regulations. The first, which comes into force on Sept. 1, will prohibit the running of vehicles on fuels other than motor spirit or diesel oil except under licence, and these licences will be issued only on condition that the vehicle is engaged on essential work and that the fuel is available. The second Order will bring an "alternative fuel" rationing scheme into operation. Regarding propane and butane, no licences will be issued even to present users. Any new conversions to producer gas propulsion will be on essential vehicles.

The position is not exhilarating at the moment, and as far as the Gas Industry is concerned, while we presume that no very useful purpose can be served by crying over spilt milk, thoughts must to an extent be retrospective. After all, the application of producer gas to motor transport is not a startlingly new proposition. On the contrary, it is hoary in history, and as a fuel industry the Gas Industry, we think, has not shown very great interest in the production of suitable fuels. It has, we feel, waited for a Government lead rather than gone forward with results, energy, and enthusiasm to create that lead. Why, for example, has it been left for a handful of gas undertakings to show in practice that with selected coals carbonized in suitable plant producer gas fuel can be made without difficulty? Why, again, did not the Industry go ahead with the activation of high-temperature coke in peacetime, albeit spurred on by Imperial Chemical Industries? The story would have been different if more lead to the Government from the Industry had been given—and altogether apart from the single use of activated coke for mobile gas producers, we think that its use domestically could, pre-war, have been developed to an extent which would have confounded the sceptics. In point of fact the Gas Industry has the processes. First, the making of producer gas fuel simply and without activation in existing plant; secondly the making of reactive fuel by alkali activation, which would mean some additional plant, Had both lines of approach been developed a few years ago *from within the Industry*, the present position of the Industry as a supplier of producer gas fuel in a state of emergency would have been very different. Even so, we think that more could be done now and in the immediate future by positive action, in face of all difficulties, in allocating to certain gas undertakings a greater quantity of the right type of coal for the production of solid fuel to replace motor spirit and diesel oil brought over the seas.

THE SCOTTISH ASSOCIATIONS

A FORTNIGHT ago we commented on the adherence, the more notable at a time when co-operative action was never more needed, of the Waverley Association of Gas Managers to the policy of isolation, and we recalled the continued advocacy of Mr. James Jamieson and others that this ante-moded policy should be changed. His latest plea was at the recent meeting of the Waverley, and his remarks on the Association's peculiar and unenviable position were reported in the "JOURNAL" of July 1. At the same meeting Mr. Jamieson put forward other suggestions regarding the broad policies of the Scottish Associations, and there must surely be a large measure of support for his views, which to our mind deserve much more than mere passing note. All will agree, we think, that these bodies have played an important part in developing over many years the idea of co-operation and mutual help within the Industry. They have provided a common meeting-ground and a platform from which subjects of common interest could be discussed. It is doubtful if, without them, the purely business associations of later growth and a more national character could have reached anything like their present state of development. But Mr. Jamieson queried whether we have not reached a stage when the Scottish Associations could, by a re-orientation of policy, contribute still further and more directly to the usefulness of those National Associations which are paid to look after the interests of our Industry. Naturally no association with a long tradition will lightly change its character or will desire to lose its identity. The point is, however, that we cannot afford the luxury of misdirected effort.

Has the time come to modify the aims and activities of the Senior Associations? That is Mr. Jamieson's major question. Is a fundamental change in procedure needed? As example, so far the subjects of Papers presented for discussion have in the main been left to the free choice of their Authors, and it naturally follows that many of the Papers deal only with a particular aspect of gas-works practice, distribution, or sales. Admitting the interest attached to hearing how individual undertakings deal with and solve particular problems, Mr. Jamieson advanced the idea that a better use of time and opportunity would accrue if the Associations in Scotland combined as a general clearing-house for problems submitted by members. Those of purely local interest might be dealt with by the reading of Papers and discussion at Junior Association meetings, and the Senior Associations could then devote their attention to clarifying Scottish opinion on matters of national importance. They would, in short, choose their subjects for discussion with the definite object of finding solutions to wider problems of policy—of defining Scottish opinion in relation to national movements. They would, he argued, become the voice of Scotland in matters relating to the Gas Industry—a voice too little heard and not sufficiently unanimous at the present time.

Voluntary Fuel Economy

The Gas Industry is backing up in a hundred and one ways the Government's campaign for voluntary fuel economy, and as an example of enterprise we have the Croydon Gas Company's scheme of appealing to the public through loud speaker. The Company's plan is the subject of a news item in our columns to-day. The Company is bringing urgency to bear on the matter of saving in gas consumption, which, of course, is laudable enough, but is there danger in stressing the need for economy of gas as distinct from general economy of fuel, and particularly of coal? We are looking at the matter from the aspect of the interests of the consumer, and we feel that, in the light of possible compulsory rationing, weight should be given to the contention made by Mr. J. E. White, of Newcastle, in a letter we published last week that in the economy campaign there is need to place great emphasis on the need for economy in fuel generally, rather than the whole of the drive being directed towards gas and electricity, or one or the other of these two refined forms of coal utilization. If the drive is directed towards one or the other of these two services,

it is quite possible that a completely unbalanced condition in the fuel industries may arise which will certainly not be in the national interest. The consumer should be advised to economize proportionately on gas, electricity, and coal. Having regard to the suggested fuel equivalents set out in the Government White Paper, the need for stressing economy in the domestic consumption of coal is, we think, of the greatest importance. We must, in brief, secure a balanced economy in individual consumption of the several kinds of fuel.

Coal Restrictions

The following restrictions on supplies of coal and coke to controlled premises (except hospitals and schools) will be in force during the three months starting Aug. 1 ; they apply to the whole quarter, and not to separate months. Except under licence from the Local Fuel Overseer, coal (other than the larger sizes of anthracite) must not be acquired in greater quantity than will raise the stock held at any time on the premises to 1½ tons, and in no case may more than one ton be acquired during the period. Coke and the larger sizes of anthracite may not be acquired in greater quantity than will raise the stocks of these fuels on the premises to 3 tons. These quantities are not rations to which everyone is automatically entitled. Deliveries will depend on the state of supplies in the area. Local Fuel Overseers may grant licences for extra quantities in special cases—*i.e.*, where supplies may be difficult to deliver in the winter, and also, if the supply position permits, to those premises whose reasonable requirements justify the holding of larger stocks. Coke and the larger sizes of anthracite are at present in better supply than other kinds of coal. People who normally use only house coal are advised to make part of their purchases in coke in order to mix these fuels when the time comes for burning them, and those who can use anthracite should buy the larger sizes and if necessary break it themselves.

Personal

Mr. G. FITTON, B.Sc., Works Manager to the Swindon United Gas Company, has been appointed Engineer and Manager to Thornton Cleveleys U.D.C. Gas Department in succession to Mr. W. J. Shelley. Mr. Fitton has occupied his present position for 2½ years, prior to which he served as Deputy Engineer and Manager to the Dewsbury Corporation Gas Department.

* * *

Mr. W. H. HANDLEY, Managing Director of Robert Dempster & Sons, Ltd., Elland, completed last month 50 years' continuous service. Mr. H. LUMB also completed 50 years' continuous service in the Drawing Office. To mark the occasion the Chairman of the Directors made suitable presentations. Three other members of the staff were similarly honoured in April, 1941.

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Friends in the Industry will be interested to learn that Colonel FAIRBANK, who is an executive of the London staff of Richmonds Gas Stove Company, Ltd. (Radiation Ltd.), has been promoted to the rank of Brigadier, to command a mobile A.A. Brigade in the Field Army. Brigadier Fairbank served through the last war with the Royal Field Artillery (S.R.), and was awarded the M.C. for services in the field. He was gazetted out with the rank of Captain. He joined the London staff of Richmonds Gas Stove Company, Ltd., in 1934.

Obituary

Announcement is made of the death, while serving with the R.A.F., of Pilot-Officer PHILIP HENRY LOWTHER, younger son of Mr. J. H. Lowther, General Manager of the Bideford Gas & Coke Company, Ltd., and Managing Director of the Barnstaple Gas Company.

Return to London

West's Gas Improvement Company, Ltd., have returned to their London Office—Columbia House, Aldwych, W.C. 2 ; Telephone, Holborn 4108–9; Telegrams, Wesgasco, Estrand. All communications should be sent to this address.

Control of Motor Fuel

The Ministry of War Transport announces that the Government have decided that in future no vehicle, whatever the fuel used, shall be allowed to operate for purposes which would not justify an issue of motor spirit or diesel oil.

Since the outbreak of war the Government have rationed motor spirit, diesel oil, and certain home-produced "liquid" motor fuels such as creosote. Vehicles operating on other fuels—*e.g.*, producer gas, coal gas, steam, electricity, butane and propane—have been allowed to have free access to whatever amounts of fuel have been available.

In view of the need for conserving not only fuel but vehicles, tyres, and man-power it has now become necessary to control the consumption by motor vehicles of fuel of every kind. The control will be effected by two Orders under the Defence Regulations. The first, which will come into force on Sept. 1, will prohibit the running of vehicles on fuels other than motor spirit or diesel oil except under a licence. Licences will be obtainable from the Regional Transport Commissioners of the Ministry of War Transport, and will be issued on condition that (1) the vehicle is engaged on essential work for which road transport is necessary (*i.e.*, work which would qualify for motor spirit or diesel oil), and (2) the fuel is available.

In the case of vehicles already operated on fuels other than motor spirit or diesel oil, applications for licences should be made as soon as possible to the appropriate Commissioner specifying the number of vehicles involved, types, and the nature of the work on which the vehicles are engaged. Owners of vehicles who intend to convert to alternative fuel operation should first obtain the necessary licence from the Regional Transport Commissioner. The second Order, which will bring an "alternative fuel" rationing scheme into operation, will be issued in due course.

All alternative fuels are, generally speaking, in short supply, and further conversions will not be possible in the case of several. Propane and butane are in such great demand for essential industry and for domestic purposes in rural areas that no licences will be issued, even to existing users. It is not, however, expected that this course will be necessary in the case of users of other alternative fuels, and, subject to fuel supply limitations, it will be the general aim of the Government to secure as many additional conversions as possible, provided that the vehicles are doing essential work. The measures now being brought into force will, however, ensure that all consumption of alternative fuels represents a corresponding saving of imported fuel, and that any new conversions which take place, including producer-gas units under the Ministry's scheme, will be on vehicles required for essential purposes.

Any inquiries from vehicle users about alternative fuels should be addressed to the Directorate of Producer-Gas Vehicles, Ministry of War Transport, 2–3, Fitzmaurice Place, Berkeley Square, W. 1.

Fuel Rationing Campaign

The Croydon Gas Company has adopted a loud-speaker direct appeal to the public to economize in gas and add effect to the Government's campaign for fuel economy. The loud speakers are installed outside the Company's new offices at the junction of Katharine Street and Park Lane.

The public address system was put to work on Friday, July 24, and since then announcements urging people to save gas have been made over it at approximately hourly intervals. The microphone and amplifier have been installed in a spare office and the announcing is done by two members of the staff.

The equipment has been supplied by Dictograph Telephones, Ltd., of Croydon. An output of 12 watts is obtained from the speakers, and it is found that this is audible in the immediate vicinity of the offices without being a nuisance in other parts of the town.

The Company tells us that it is a little difficult to gauge as yet the public's reaction to the exhortations to save gas, but it has been noticed that immediately the voice starts coming from the loud speakers many people are attracted and stop to hear all that is being said.

Although there is a by-law in Croydon restricting the use of loud speakers in public, the Company has the full support of the Town Clerk of Croydon and, of course, the Police were notified.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

INSTITUTION DISCUSSION

WRITTEN CONTRIBUTIONS ON COMMUNICATION No. 248

THE GAS INDUSTRY IN RELATION TO POST-WAR DOMESTIC ARCHITECTURE

By E. CROWTHER

(*Continued from p. 170*)

Mr. **F. A. Hooper** (John Wright & Company, Ltd.), wrote: It is anticipated that in the post-war home more space will be allowed for the kitchen than has been the practice of recent years, and that adequate room will be provided for cooking, water heating, laundry, and refrigeration services, as well as the needed cupboard and storage spaces. An ideal arrangement would be completely built-in units to a standard height, the tops of the cupboards being used as tables. Cross sections of opinion which have recently been obtained through women's organizations in connexion with kitchen design show divergent views, but a well-designed, spacious room will be welcomed by the majority of housewives.

The importance of ventilation cannot be too greatly stressed, and no effort should be spared to ensure that adequate flues are provided in all post-war houses. Unsatisfactory ventilating bricks in bedrooms were prevalent after the last war in order to save building costs; steps will doubtless now be taken to ensure that, while there shall be no financial waste, there shall also be no unwise economy which will mean the elimination of anything which is essential to good health.

The provision of a canopy connected to a flue, to take away not only the products of combustion but also the steam and fumes of cooking, is most desirable. The height of sinks, adequate hot water supplies, ash disposal, &c., are now appreciated as also being vital for the comfort of the home.

The labour saved in an all-gas house would enable considerable economies to be effected in household expenditure. There is, however, a large section of the community which regards an open solid-fuel fire as an essential part of home life, and the modern coke grate fitted with a gas burner will meet these requirements. A back boiler can be provided for water heating in conjunction with a gas circulator.

The Author suggests that in post-war homes the cooking and heating equipment should be supplied by the landlord and covered in the rental. The landlord will, of course, be the local Corporation or Council, and there is not likely to be any building for private letting. If such a scheme were adopted it would be necessary to include some provision for the replacement of apparatus after a reasonable period of use; otherwise gas appliances which are landlord's fittings are likely to remain in service long after their period of efficient service has passed, and the replacement by up-to-date appliances would not be anything like so rapid as where the apparatus is either hired or purchased by the user. Maintenance costs may also be rather heavier than when the consumer has some direct interest in the appliances.

New methods of charging for gas to domestic consumers will doubtless be evolved. A number of Government building estates, housing munition workers, have adopted a fixed charge basis—the weekly rental including the cost of cooking and heating services. Some housing authorities favour a similar scheme, and the possibilities of introducing this method generally may be well worth consideration on the basis of the "useful heat consumption" figures quoted by the Author.

The summary of annual costs given has a number of points of interest. It would be helpful if the basis of charge for gas supplied could be stated. For the "all-gas" condition the average charges per therm in the six cases are as follows:

Example.	Average charges, pence per therm.	Gas equivalent of a ton of coal, therms.
A	4.28	116
B	4.06	131
C	4.23	134
D	3.81	138
E	4.25	120
F	3.91	139

In the above table there is also given the gas equivalent of a ton of coal as deduced from the "all-gas" section of the Author's table. The figures are interesting having regard to the figure of 100 therms per ton which has been mentioned elsewhere.

THE CONTRIBUTION OF THE GAS INDUSTRY IN THE DOMESTIC FIELD TO NATIONAL FUEL ECONOMY

By Dr. HAROLD HARTLEY

Mr. **G. E. Currier** (Bradford) wrote: Dr. Hartley's figures showing the proportion of the various fuels used in the home clarify and throw into sharp relief the great development still open to the Gas and Electrical Industries. The voluntary change-over from raw coal is much too slow, and it is hoped that after the war the burning of raw coal will be considerably restricted by legislation. The Gas and Electrical Industries supply less than one-third of the present household needs, and when one considers that to-day space-heating is only carried out in one or two rooms of the house, the remainder being unheated due to the inconvenience of lighting fires for short periods, and that an improved standard of living is sure to follow the war, then the total potential load is obviously enormous.

When dealing with the estimated total number of gas appliances in use for cooking, and water and space heating under the various headings, the Author mentions that no data are available for the latter two purposes, but estimates these to be one and two million respectively. This lack of vital information cannot be condoned, and every undertaking should take a census and keep an up-to-date record of appliances installed.

The future progress of the Gas Industry depends on the retention and development of the domestic load. The frank statement by Dr. Hartley, at the end of his conclusion, regarding the necessity of a low commodity rate for the domestic user is welcomed. What is being done about tariffs and other matters vital to the Industry?

During the past twelve months Committees of Enquiry set up by the Institution have carried out valuable work in regard to coke quality, gas quality, standardization of appliances and sulphur removal. Also one reads in the Technical Press that the Post-War Planning Committee of the British Gas Federation has set up Sub-Committees to deal with manufacture and distribution, utilization, methods of charge and statistics, and the co-ordination of gas undertakings.

In reviewing the period since the last meeting of the Institution, the most notable event has been the setting up of a Directorate of Gas Supply under the control of Dr. E. W. Smith—many will consider this the most important development since the last war.

Coming to the Industry itself, although one readily acknowledges the excellent work which has been done by the Institution, one cannot but feel that certain fundamentals have not yet been tackled, or, if they have, only the fringe of the problems has been touched. Any reorganization of the Industry must include national organizations, but they continue as heretofore. Under the existing constitutions the Institution is the only really democratic body, inasmuch as a proportion of the personnel of its Council undergoes a change compulsorily each year. It is hoped that a similar policy will be adopted by the Gas Research Board. This change of personnel is essential to avoid stagnation.

The second fundamental is the regionalization of the Industry, and so far there is no record of any progress being made. The Sub-Committee dealing with co-ordination of gas undertakings may or may not envisage regionalization, but it is essential that this problem should be tackled in principle by the Industry, and the detailed working out by a body of experts would then follow.

The third fundamental is gas tariffs, and here again there is a Sub-Committee under the heading of "Method of Charge and Statistics," but the extent of the progress made is not known.

Many in the Industry feel that the time is fast slipping away, and that we may find ourselves at the conclusion of hostilities before any of the three fundamentals set out above have been seriously tackled and schemes put forward for the reconstruction of the Industry. The Industry has a wonderful opportunity to put its house in order itself; will it be taken?

Mr. **L. B. Chapman** (Skipton) wrote: The Author has omitted from Table 4 the case of the gas or coke boiler used centrally for space-heating, and I should like to have his opinion on the trend of this form of space-heating for domestic purposes. I feel that it has a place in the type of house identified as Case B, and the following example of actual results over a period of two years may be of interest. It refers to a six-roomed semi-detached villa, rateable value £33 (gross value £43).

(*a*) Gas cooker + independent gas boiler for hot water + gas boiler for central heating:

Average daily cost—Cooking	.	4d.
Water-heating	.	4½d.
Space-heating (gas)	.	6¾d.
		15¼d.

(*b*) Gas cooker + independent gas boiler + coke-fired central-heating boiler (convertible type).

Average daily cost—Cooking	.	4d.
Water-heating	.	4½d.
Space-heating (coke)		4½d.
		13d.

In each case one coal fire was used as an auxiliary, and the average cost for the same period was 2¾d. per day. I have found that in this part of England the space-heating demand is higher than that mentioned by Dr. Hartley; the figure approaches 80,000 B.Th.U. per day in middle-class houses.

Our aim is to replace the coal fire by a coke fire. The problem is

not one of cost, but of supplying coke of a consistently suitable quality and size. This has been made easier by technical development in coke preparation, but is now more difficult because of the generally higher ash content of the coals supplied.

In this example, coal and coke were supplied at delivered prices of 50s. and 41s. 8d. per ton respectively. Gas was supplied for cooking at 8.6d. per therm and for water and space heating at 4.2d. per therm, and the results underline the importance of the Author's reference to a low commodity charge.

Mr. **L. Friedman** (London) wrote: The contribution of the Gas Industry to national fuel economy is indeed great. One may say that the ideal of the Gas Industry is one of national service. This, unfortunately, is not evident from Dr. Hartley's Paper. In fact, the picture which he paints is dark, but is the pessimism justified?

The data accumulated could be significant only if used for a specific purpose, to prove or at least to indicate the very objective fact which forms the title of the Paper. It is also noted that in many cases Dr. Hartley's figures are very much at variance with those published by C. A. Masterman in his Paper "The Future of Gas Appliance Design." It is especially important that in a publication which will meet the eyes of those concerned with post-war planning, particularly architects, heating engineers, planners and municipal authorities, not to mention the electrical industry, basic facts should be analyzed and without bias.

Whether it is advisable—as Dr. Hartley seems to think—to utilize solid fuel rather more than in the past, or whether electricity, gas, or other fuels should be the right ones, is not proved.

National fuel economy involves the evaluation of fuel resources in such a way that the final cost of the fuel available to the domestic consumer should be the true cost based on cost of production and distribution, providing for the people engaged in such work social security, fair wages, and good working conditions. The cost should not be influenced by cut-throat competition, heavy advertising expenditure, subsidization of street lighting, and so on. The consumer should be at liberty to choose the fuel he wishes at a true price. Once the nation's fuel resources have been evaluated the consumer should have placed at his disposal such facts on fuel and appliance utilization as to enable him to choose the most satisfactory service within his means and taste. Although cost is one of the factors which guides the consumer's choice of a particular fuel or appliance, it is not the only factor, and certainly is not the decisive one. Not to discuss in a Paper on this subject such points as labour saving, cleanliness, atmospheric pollution, temperature regulation, ventilation, etc., is to ignore most important factors.

With regard to hot water, it would be interesting to know whether Dr. Hartley in fact fully believes in his remark about an "instantaneous gas water-heater delivering a mere trickle of hot water."

There is not the slightest doubt that from the point of view of national fuel economy the instantaneous gas water-heater is the most rational way of providing hot water for most homes. Economy of use increases in the following order:

(1) Uninsulated thermal storage set (gas or electric) in operation day and night.
(2) Insulated thermal storage set (gas or electric) in operation day and night.
(3) Insulated thermal storage set (gas or electric) clock controlled with rationed supply.
(4) Insulated thermal storage set (gas or electric) in operation only for the period required to heat the water actually to be used—the consumer has to calculate when hot water is required and when to light the gas.
(5) The instantaneous gas water-heater.

Only with the instantaneous gas water-heater is the greatest economy of use combined with increased flexibility.

It is at present a fact that coke provides the cheapest form of fuel for water heating. The present charges for gas and coke, however, are not true costs, nor do they take into account methods of gasification now under consideration.

In spite of this, the housewife does pay more for a service that is labour saving, in order to have rest and leisure. Why spend years of drudgery simply because some coal-burning appliance may be improved slightly in thermal efficiency? It is service which is important, not price.

UNIVERSITY TRAINING AND THE GAS INDUSTRY

By Prof. D. T. A. TOWNEND

Mr. **F. C. Briggs** (Dudley) wrote: The Gas Industry's technical problems fall into two general groups—manufacture (or production) and distribution (or absorption). The "training of personnel" problem falls into the same two categories. Personnel of all classes, but particularly the higher grades with which the Paper deals, have to be trained systematically but with foresight as to their absorption into the Industry. The present "catch-as-catch-can" method can continue—men being trained generally as engineers, chemists, chemical engineers and commercial men, and the Gas Industry can adopt such as it needs from the general pool. This means, of course, competition between industries for suitable men, but something more appropriate to our own Industry is felt generally to be needed, and the training, while not being too narrow or specialized, should be particularly adapted to the Industry's needs. If such be the case, some thought must be given to the definite absorption into the Industry of the men so trained.

This problem is a very difficult one. In the manufacture of an article the raw materials can be tested and the quality and type of the final product assured. Such is impossible with human material. Nobody can say at the commencement of a man's University career exactly what his capabilities will be at the end, particularly with men trained for the higher posts in the Industry where the capacity to manage and direct other people is so important. Nevertheless, I suggest that some attempt will have to be made to rationalize the absorption of the more highly-trained men into our Industry; otherwise there must occur recurrent shortages and surpluses of supply resulting from the individual investigation of the possibility of careers. Moreover, the number of positions of responsibility available in the Industry obviously become less the higher the scale of responsibility. To train all men in the position of junior technical assistant, for example, to a high University standard when very few can reach important and lucrative positions of responsibility, or to train an excessive number of men ostensibly for those high positions, must lead to a sense of frustration and eventually to a renewal of the shortage of suitable men that such a scheme was framed to avoid.

Can the Industry as a whole contemplate the compilation of a census of requirements of skilled technical men, of varying degrees of importance, covering, say, the next 15 years, including wastage and the requirements for expansion, and then set out to find and train suitable men? It may be said that even now the Industry could absorb quite a large number of highly-trained technical men with advantage, but it is doubtful if the need for such men is fully recognized in the places where they are in fact needed, and therefore the problem needs to be faced as a whole and leads to post-war planning consideration.

There is another problem, not completely unconnected with the first, which the Paper and the discussion have set us—the question of maintenance. The picture is gradually being drawn for us of a higher school-leaving age, a higher school-leaving standard, a longer University course, probably of five years, with an intervening period of practical experience in industry. The age at which a man commences to assume responsibility in industry is therefore tending to become later and later, but men are not robots; the picture is incomplete without some regard to social questions, such as, for instance, family life. The higher careers, modern thought assumes, must be open to all suitable men irrespective of the financial standing of their parents, and one is therefore forced to contemplate a somewhat elaborate, and it may be thought dangerous, system of State maintenance: dangerous because of the relief from the individual of a great deal of personal responsibility.

Professor Townend suggests that the employer should subsidize a man's University career. The other side of this proposition is that the employer possibly may reap no benefit from such a course, the man subsequently transferring his services elsewhere. The larger gas undertakings, of course, have for years trained men, many of whom eventually transfer to other employment, but hardly to this extent. Moreover, the best men are not necessarily born in the largest towns, and practical training in a large undertaking is not necessarily the best, except for specialists. The men in smaller towns need an opportunity of University training, and the practical training on the medium provincial works may be very suitable, but the undertaking may not in fact be able to provide sufficiently important careers after the training. They have no chance, therefore, of retaining such a man, and so cannot be expected to subsidize his career to such an extent.

These problems all bring one to the consideration of post-war planning. This seems to commence with the question of the co-ordination of gas undertakings into larger units, with possibly regional direction and national guidance. If this be so, then it adds emphasis to one other point in this Paper. However much we may consider it necessary to reorganize the Gas Industry for the future, we have reason to be proud of the Industry's past record. This record is the result largely of the work of the Engineer and Manager. The co-ordination of gas undertakings in the future must lead to greater specialization, and the general direction of policy and organization will probably pass from the hands of the expert engineer, whose energies will be fully occupied with technical matters. While it may be true that ultimate control must be ruled by financial considerations and therefore by those who represent finance, this control would wisely be very broad, and guided by a general manager or managing director in full control of the policy and organization of an undertaking. Such a man, however, would be inadequately equipped if he were entirely unversed in technical matters. Thus the Author is very timely in calling attention to the inclusion of suitable technical subjects in the course for commercial degrees.

Dr. **E. A. C. Chamberlain** (Gas Light and Coke Company) wrote: Post-war education must surely be able to improve on the past, and it is to be hoped that technical training will be one of the first to benefit. It would be interesting to have the Author's views on the inclusion of at least one year's research as qualification for a degree. Degree

courses in science and engineering to-day have become so specialized that it is only the brilliant student with a "card index" memory who can find time to become "educated," in the broader meaning of the word, and as it was applied to the University training of calmer years. The average graduate to-day has little time for reading generally, and the type of teaching necessitated by the intensive cramming practised to-day seriously limits, if not altogether obviates, his personal contact with the University staff. Thus, two of the most important features of the older University training are missing—namely, the encouragement to think originally, and the advantages of personal discussion with the best authorities in the subjects which interest him. A year's research on the informal lines on which it is organized to-day would correct this. The overhanging fear, which is always present with the financially-aided student, of failing an examination and losing his grant, is gone when the degree is passed and he can at last begin to look around and take stock of his position. It is generally at this stage that the student finally narrows down the work he intends to do, and a post-graduate year attached to a University research group would be of inestimable value to himself and to the employer who ultimately takes him. Should the student show promise, he could continue with research for a higher degree, but in any case the year spent in contact with specialists working for "its own sake" will provide the broader outlook so frequently lacking to-day.

A second point is the need for modification of the present system of evening-class degrees. Much can be said in their favour, but a student who can persevere through five years of peculiarly hard and exhausting work is surely worth a University training, and any man who shows such perseverance—say, to Inter-Science standard—should be given the opportunity of the two years he requires at the University to finish his degree. All too frequently the evening-class degree—so hardly won—is considered by employers as second-rate. This is unfair but understandable, and every effort should be made to promise a better system of training to the man who has the ability and perseverance which can be most valuable to any industry.

In conclusion it is to be hoped that the belated discovery of the importance of fuel to the nation will result in fuel technology taking its rightful place in the scheme of all University training.

Mr. **A. G. Grant** (Darlington) wrote: The number of students who have passed through the Fuel Department at Leeds is disappointingly small, and it would seem necessary to emphasize that the Leeds contribution to the science and thought of the Gas Industry has been far larger than this small number suggests. The Leeds teaching has aimed perhaps primarily at turning out men with trained and critical minds; its research has been sound and accurate. As the focal point of scientific thought in the Gas Industry it has imbued the Industry with its own standards, and to-day I believe that, as a result, the Gas Industry is less superficial and scientifically more honest than many other Industries.

It is of prime importance that the Industry should realize the value of the trained mind as contrasted to the fact-filled mind. The first obligation of a University is to produce men trained to think; men so trained will prove their worth whether their later vocation is for pure research, technology or business administration. If to the ability to think is added a knowledge of industrial processes, the University graduate cannot fail to be of the highest value in the Industry. The Fuel Department has always suited its teaching to these aims, and indeed it did pioneer work in this sphere when so many University schools were still devoting much time to the straightforward supply of facts and figures.

The proposed introduction of Chemical Engineering into the Leeds curriculum is perhaps the most important feature of Professor Townend's survey. Many graduates have wished that the Leeds course could have included this field, and I hope that it will now be possible to teach Gas Engineering and allied processes as examples of the broad principles of Chemical Engineering and not as processes peculiar to the Gas Industry. Clearly the student who understands, for example, distillation and heat transfer is better able to design and operate such apparatus as benzole plant than one who knows these subjects only as methods of producing benzole. In other words, comparative knowledge is ultimately of more value than specific knowledge. It would seem that Leeds is particularly well fitted to conduct a Chemical Engineering course since there will presumably be made available the accumulated experience and a number of examples of plant in the other technological departments of the University. Incidentally I would emphasize the importance of the teaching of fairly advanced physical chemistry. So much of gas engineering and indeed chemical engineering is in fact the application of physical chemistry to industrial processes, and physical chemistry, like mathematics, is a subject which can best be acquired effectively as part of a University training.

I would support the argument for a degree title of a more generic nature to correspond with the broadening of the curriculum. In addition to its effect on prospective students, the term "Gas Engineering" does not in fact cover either the present studies or the many sides of the Gas Industry itself. Moreover, it should be, to the Gas Industry, a matter for satisfaction that students trained under its auspices are fitted to enter other branches of chemical engineering when the occasion arises.

In regard to research I think that too much significance can be attached to impressive plant and laboratories. In the case of what Professor Townend terms "objective research," which often is development rather than research, a goal is in sight, and it is desirable that equipment and facilities should be available to speed the approach to it. Exploratory research is far more the product of the mind of the man engaged on it; this product is not a finished process, but rather the vision or germ of an idea. While, therefore, a first class research worker should not be hampered by lack of equipment, I believe that his mind and not his apparatus is the creative force to which we should cling.

The Paper emphasizes the contribution the University has to make in post-war planning. In my view the Universities may then have a new role to play as stabilizers of thought and standards. If, as seems probable, there is after the war a popularizing of scientific and technical knowledge coupled with increased propaganda and political activity, it may at times be hard to ensure that the development of a public service industry such as ours is on sound lines. Here will appear the new role of the Fuel Department at Leeds as at once the yardstick and focal point for the thought, facts and standards which will form the basis for post-war planning and development.

Mr. **D. M. Henshaw** (Huddersfield) wrote: The early training of men for the administrative and technical services of the Gas Industry has of necessity always been a difficult problem. While the knowledge and practice of civil and mechanical engineering are still of major importance in the processes of coal carbonizing and gas production, the growth of knowledge of such processes has made necessary the aid of the trained chemist and physicist, so that the art of gas manufacture has become a complex engineering problem.

The Author has shown a clear recognition of the difficulties which must be met and overcome in providing a training at a University which will produce graduates equipped with such knowledge as will enable them to qualify for responsible positions in the administrative and technical branches of the Industry. All the indications at the present time point to a greater realization by industry and the public, with State direction, of the importance of fuel utilization, and there will undoubtedly be a greater call for the best brains equipped with the right kind of training in all the fuel industries. It is, therefore, all the more important that the Gas Industry should see to it that such men are available in numbers sufficient to enable it to serve the community to the best of its ability.

Future demands may require that courses such as that established by the Gas Industry at Leeds may develop in other Universities, but at Leeds there is a foundation laid by such men as Smithells, Bone, and Cobb capable of bearing an edifice many times greater than that at present existing, and the broadening of the basis of training recently initiated, with encouragement from gas undertakings and constructional engineering firms and appliance manufacturers, may well lead to a greatly increased output of graduates in the post-war years under the guidance of Professor Townend and his colleagues. The analysis referred to in the Paper shows that out of 200 students who have passed through the Department since its inception, roughly one-half are employed in the Gas Industry, of which fifty are occupying positions as chief officials or assistant engineers or managers of undertakings. Almost an equal number are serving with industrial firms and appliance manufacturers. This is, of course, in addition to a large number of graduates from other Universities, many of whom have already become leaders in our Industry.

With the increase in the concentration of manufacture in larger works on the one hand, and the growth of distribution and utilization technique on the other, there will undoubtedly be a greater demand for the product of the Universities, calling for an intensive effort to satisfy this demand. There is also the equally important, and, indeed, indispensable need for training for research.

I suggest that the information provided by Professor Townend regarding the wider type of training now available should be given the greatest possible prominence. I refer particularly to the four-year courses, and also to the facilities for entry, without matriculation, of men from undertakings and manufacturing concerns.

Although it is believed that an increase in financial aid from the State is to be made available, this nursery for the Industry we possess at Leeds calls for the generous support of both the larger undertakings and of the industrial firms engaged on works construction and appliance manufacture. There is a need for more scholarships and other endowments, and other forms of assistance, such as would enable not only students, but members of the teaching staff, to obtain knowledge of the Gas Industry in other parts of the world. I think it is especially important that financial aid of this kind should be available to encourage suitable students to complete a four years' course.

Finally, I would like to acknowledge, as one of the older generation, the solid worth of a University training, numbering, as I do, many graduates of Leeds and other Universities among past and present colleagues in my own Company.

A Meeting of the Central Committee of the Federation of Gas Employers will be held at Gas Industry House on Tuesday, Aug. 11, at 11.30 a.m.

A Meeting of the Central Executive Board of the National Gas Council will be held at Gas Industry House on Aug. 11 at 2 p.m.

A FLASH-BACK INSTRUMENT*

By J. A. MORRISON, *The Consumers' Gas Company of Toronto*

SEVERAL years ago I commenced an investigation into the causes of the large number of complaints on gas appliances. On a shelf in my laboratory was an instrument invented in 1920 by a Mr. Blomquist, of the Stockholm Gas Company, Sweden, which was called a Nedslagsbrannare—in English it would mean Flash-Back Burner. This instrument had been purchased in 1924. Since many of the consumers' complaints were caused by burners backfiring or being excessively noisy, it was hoped that this odd-looking Swedish instrument would measure some quality of the gas which was perhaps having more effect on satisfactory burner operation than either calorific value or specific gravity.

So the Swedish tool was put to work, and observations were made every half hour and compared with the actual performance of various appliance burners. It was soon found that when the instrument gave a low reading, of, say, 23, the gas flames on bunsen burners were very sharp and susceptible to flash-back, and when the reading was high, say, 32, the flames were long and tending to give incomplete combustion if the burners were overloaded. Now, odours can be caused by bunsen burners backfiring due to the flames becoming too sharp, and also by smothering and incomplete combustion due to the flames becoming too long.

This variation in the flame structure is characteristic of mixed gases, and becomes quite pronounced where carburetted water gas is used only for peak load periods. There is also a difference in the gas from horizontal and vertical retorts, especially if steaming is done in the latter. This Swedish instrument has been very useful in indicating better ways of mixing these different gases. It was also the means of clearing up the mystery of why burners in a certain large plant should backfire at about 4.40 p.m. on several consecutive days. To solve this trouble it was necessary to read the flash-back index number every minute from 4.50 to 5.00 p.m. to make allowance for the speed of gas in the mains. Our observations led us to believe that the burners had been tripped off by either air or unmixed water gas in the city mains. The works department subsequently found that a certain shift operator was inadvertently leaving a water gas valve open for as much as ten minutes on the days when there was trouble. For detecting trouble like this, the Nedslagsbrannare has the usual slow recording instruments beat a dozen times over. The Swedish flash-back tester is essentially a bunsen burner with an adjustable primary air opening with the size of the opening indicated on an empirical scale. To operate it, the gas is turned on and ignited and the pressure adjusted to 3 in. water column. The air shutter is then opened gradually until the flame starts to give an occasional sputter. This point gives one reading on the instruments, but our practice is to increase the opening, also the readings, about another 10% to the flash-back point. Taking the reading this way, after about six sputters, seems to give a more definite point on the scale, so much so that various operators usually read the same indications with the maximum deviation being 1/2 index number.

It does not matter whether the room is bright or dark, since there is no cone to observe, and atmospheric temperature and pressure do not appear to affect the readings. When the flame backfires to the orifice it just requires the lifting of a cylindrical sleeve to close the primary air opening completely and to put the flame on the port again. In this manner, several check tests per minute can be made if necessary. Since the air opening is vertical there is never any trouble with dust and lint choking it up and, in addition, the lifting of the sleeve has a cleaning effect. The instrument is light in weight, readily portable, quite rugged and practically fool-proof.

What the instrument measures is the cone-forming and flash-back properties of city gases. The index number is influenced by calorific value, specific gravity, theoretical air required for combustion, and flame velocity.

What we want is someone to win a medal for discovering some inhibitor to add to city gas to stop it from backfiring. In England they have been experimenting with flash-backs and inhibitors, but the war prevents disclosures.

Gas-Testing Burners

The first gas-testing burner that I am going to mention is the Lanphier Caloroptic, invented by C. Lanphier, an American, in 1918, but first made in Toronto by the Sangamo Electric Company. The present manufacturer is the Connelly Iron & Sponge Company, Chicago. The patent states the instrument to be a portable calorimeter. The adjustable primary air shutter on this burner has 40 threads per inch and is graduated like a micrometer, reading directly in B.Th.U. The reading is made when sufficient primary air has been admitted just to bring the yellow tip on the inner cone to the vanishing point.

An adjustable needle valve in the gas orifice allows the instrument to be calibrated against any standard calorimeter and, if always used on that same gas, will indicate the gross calorific value to within a couple of B.Th.U. Tests made on a recently acquired Caloroptic show that the reading is low if the percentage of carbon monoxide in the gas increases, and slightly high if the percentage of benzene increases. This is because the instrument indicates the net calorific value multiplied by the theoretical air required per cubic foot of gas, divided by the square root of the specific gravity. Carbon monoxide is the gas departing most from the average valves. For the usual gas variations the reading is fairly accurate and shows gas changes instantly. However, inasmuch as the Caloroptic measures calorific value, it is not as sensitive in indicating a gas likely to cause back-firing as the Swedish flash-back instrument. At the present time, it appears to be the only gas-testing burner of any kind procurable on this continent.

The next important test burner obtainable is the Aeration Test Burner, manufactured by Alexander Wright & Co., England, and is the standard in that country. This test burner gives a numerical expression for the cone-forming properties of city gas, much like the Swedish burner.

In Holland before the war, the general conditions for appliance testing required that an appliance adjusted on a standard gas of Prufbrenner number 65 should, without any alteration, accommodate gas of numbers 57 to 70 without lighting back or exceeding CO limits.

The Aeration Test Burner has proved very useful for controlling the quality of mixed gas in Great Britain, and particularly so in seeing that the flame does not become so sharp that flash-backs are likely to occur.

The only Aeration Test Burner known of in Canada is one that Vancouver apparently has. The counterpart of the Aeration Test Burner in the United States appears to be one made by the Rochester Gas Company, on which over 200 different gas mixture tests were made from 1938 to 1940 and recorded. The burner tube is $\frac{3}{4}$ in. diameter without a water jacket. The orifice is No. 69 drill size and the gas pressure is regulated to 3 in. water column. The adjustable air shutter is read when the inner cone height is 1 in. The normal reading of Rochester gas is 69. A reading of 52 indicates back-firing tendencies, while a reading of 86 indicates long flames and yellow tips. In terms of primary air/gas ratios for an average specific gravity, the readings equal a low of 2.4, a normal of 27, and a high of 3.0. Readings of the flash-back point were also taken and on the average were a little more than twice the number for a 1-in. cone. However, the graduated scale on the Rochester burner does not start at zero like on the English and Swedish burners, but at some point about minus 100, so that comparisons are complicated. Of the large number of gases tested, two or three have a B.Th.U. value just below the 500 mark, and the flash-back number of 100 indicates about a 3.4 primary air/gas ratio —the same as on the Swedish instruments.

The latest test burner to come to my attention is the Flamdicator. This instrument has a fixed air shutter and measures the change in temperature of the burner head. Sharp flames give high temperatures and soft flames low temperatures. Where the Flamdicator is used the normal mixed gas of 800 B.Th.U. reads 60, and gases with sharper flames are interchangeable in peak load periods provided the reading does not go higher than 200. Straight carburetted water gas of 800 B.Th.U. reads 570 and, of course, is not interchangeable.

Other notable test burners of which, no doubt, many are still in use, are listed below:

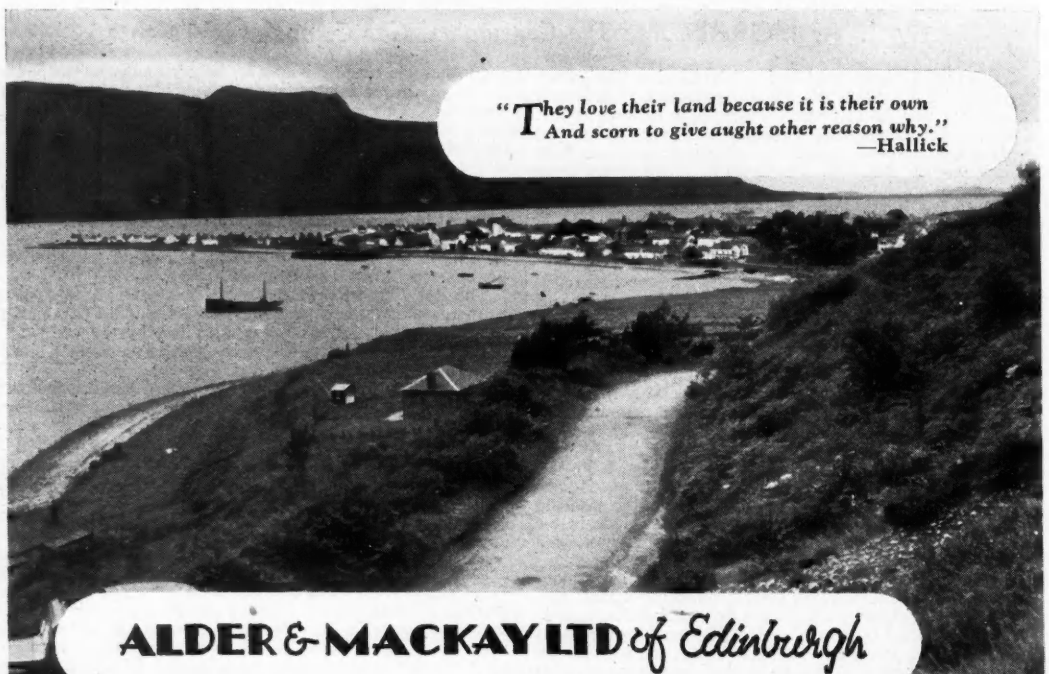
Name.	Country.	Year.	Method of Operation.
Hofsass	Germany	1919	Read height of cone for fixed air shutter.
Remarks: Difficult to make fine readings.			
Ott	Switzerland	1925	Read calibrated air shutter for sputter or flash-back.
Remarks: Much like Swedish burner; widely used.			
Prufbrenner by Czako & Schaack	Germany	1934	Read calibrated air shutter when inner cone 15 mm.
Remarks: Very elaborate and expensive, with mirrors, lens, and lights.			
Burna, by Gray	England	1934	Read B.Th.U. on air shutter for sputter point.
Remarks: Reads low on water gas, like Caloroptic.			
Hawes	England	1937	Read calibrated air shutter for sputter or roaring point.
Remarks: Like Ott burner, but has water jacket.			

This makes a total of nine gas-testing instruments with no two of them giving identical readings, although all have been invented for the very important purpose of measuring the resultant flame characteristics of city gas when burned in a bunsen burner where a part of the air for combustion is injected by the gas stream itself. Which one of these testing instruments is the Canadian Gas Association going to accept as a standard?

Controlling Gas Quality Without a Test Burner

If a flash-back testing instrument is not available, other means can be employed for gas control. The specific gravity is commonly used for this purpose and may prove quite satisfactory where just one

* From a Paper at the 35th Annual Convention, Canadian Gas Association.


"They love their land because it is their own
And scorn to give aught other reason why."
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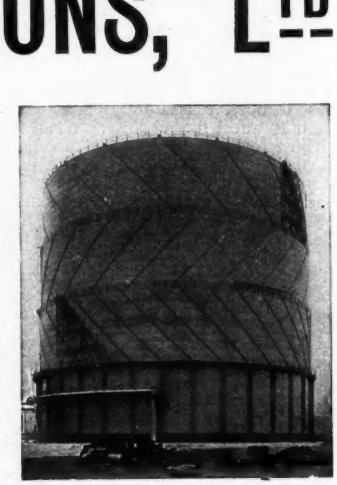

GASHOLDERS

PURIFIERS CONDENSERS RETORT HOUSE EQUIPMENT

STEEL TANKS FOR OIL STORAGE & GASHOLDER PURPOSES

COAL AND COKE HANDLING PLANTS

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plant is involved, but it is not satisfactory where the mixture is composed of horizontal retort coal gas and vertical retort steamed gas, both mixed with carburetted water gases, as my observations have shown that there is no worthwhile relationship between specific gravity and flash-back index numbers for such conditions.

The calorific value is another property that might be considered. However, there is only a rough relationship between B.Th.U. and flash-back index numbers. For instance, a mixed gas of 475 B.Th.U. might have a F.B.N. of 24½, which would be in a satisfactory region, while another gas with more carbon monoxide and less hydrocarbons and inerts of 485 B.Th.U. might have a F.B.N. of just 23½, which would place it in the flash-back area where trouble could be expected.

Combining the calorific value with the specific gravity gives us the relative rate of thermal flow, or the Wobbe index number $H/\sqrt{D}$. This factor allows more latitude in the calorific value if it is compensated for by a corresponding change in the specific gravity.

Notwithstanding the importance given the Wobbe Index Number in Europe, it has three bad faults. It does not consider the theoretical air required for combustion or flame velocity, and any control limits set must of necessity be rather narrow for the simple reason that the two above-mentioned essential properties are not included. The first fault is corrected in the A.G.A. index M, which is equal to HA/D, where A is the theoretical cu.ft. of air required per cu.ft. of gas. Inasmuch as the ratio A/H is low for carbon monoxide and hydrogen, this index number indicates the true characteristics of these two gases even better than the Wobbe index, and increases the spread between carbon monoxide and the other gases. The computed limits for the index M, comparable to the previous two already given, are down 7% and up 10%.

The disadvantage of using the M index number is that it requires an analysis of the gas to determine A. However, for rough calculations A can be assumed proportional to H and the factor become H^2/D. Since this is the square of the Wobbe index it has no advantage over it. The limits are equal to the square of the Wobbe index and become, down 5.0%, and up 6.7%.

An improvement over the M index is the A.G.A. C index, which equals the M index minus a K factor for flame velocity. This K factor is roughly proportional to the flame velocity in meters per sec., and the way it modifies the M index is to lower it when the hydrogen or ethylene content of the gas is high and to raise it when the methane content of the gas is high. It will be seen that the K factor for carbon monoxide is just about average, while the K factor for ethylene is much higher, yet carbon monoxide is the constituent that causes flash-backs. This shows that actual burner operation bears no more relationship to the K factor than to flame velocity, so, for this reason, the K factor should not be used alone but only in conjunction with the M index to give the well known A.G.A. interchangeable formula in which the index C is determined. The A.G.A. recommended limits for C are down 15% and up 15% from the adjustment point. Since manufactured gases of less than 500 B.Th.U. per cu.ft. are susceptible to flash-back, it is recommended by the writer that where a drop in the C index of 15% from a normal gas does not prevent flash-backs, the 15% be reduced to 10% to see if the flash-back trouble can then be eliminated. The A.G.A. formula has the effect of taking hydrogen away from the hydrocarbon group where it was placed by the Wobbe index number and putting it beside carbon monoxide to give two short flame gases. Unfortunately, the complications involved in computing the C index do not allow it to be determined for individual gases.

By operating the Swedish instrument to give a fixed cone height (the Aeration Test Burner method), we were enabled to arrive at approximate ATB variations for a manufactured gas. Operating the instrument with a fixed air shutter (the Hofsass method) produced different cone heights which appeared to have the following relationship to the flash-back number of the gas:

$$\text{Cone height} = 0.125 \times \text{FBN} - 2.4.$$

Table I is a summary of all the control factors discussed with the permissible variations from the mean value listed in the order of increasing magnitude.

TABLE I.—CONTROL FACTORS

Method.	% Decrease. Doubtful	% Increase. Doubtful
Specific gravity	1.23	1.64
Calorific value	2.5	3.3
Wobbe index number	2.5	3.3
Lanphier Caloroptic	5.0	6.7
H^2/D (square of Wobbe)	7	10
HA/D (A.G.A. M index)	8.1	10.3
Hydrocarbon content	10	13
Aeration test burner	10	15
A.G.A. C factor	11	15
Swedish flash-back number		

In using this list it is obvious that the methods at the top are the least favourable and those at the bottom the most favourable because of the latitude allowed. In every case one or more instruments must be used and, therefore, the choice of method depends upon the instruments available. In addition to allowing a wide latitude the Swedish instrument speedily and easily, without mathematical calculations, moulds all the variable factors into one numerical reading. It seems to the writer that there is a very great need for the standardization of some such instrument.

Conclusions

Observations made on a Swedish flash-back instrument have shown it to be a tool of victory for the home front in maintaining trouble-free gas for our vital war industries, and in freeing servicemen and gasoline and rubber for other more important tasks. After the war is over, competition for cooking and water heating will probably be keener than ever, due to the surplus of electric power, and it will only be by the continued use of victory tools and scientific methods that we can hold our own. The satisfactory combustion of gas with bunsen burners requires that the gas be of fairly uniform quality, more so with modern appliances than formerly, because of the variety of accessories, automatic pilots, thermostats, &c., that are now considered as standard equipment.

If we had a standard instrument for making tests of gas quality it would allow of an exchange of information, and research work carried on in one gas-works could be applied in another works. Nine different testing burners have been described in this Paper and, no doubt, there are gas companies on this continent using other "pet" burners, perhaps home-made, for the simple reason that there is no standard available.

The writer is only one of many who have realized the need for a standard instrument, and surely after all the work that individuals have already done in designing burners, it is time that the Gas Industry had a standardized test instrument like the petroleum industry.

The undertaking is so big that it should be given either to the American Gas Association Laboratories or to the recently founded Institute of Gas Technology to complete. To support the plea for a standard instrument, I am going to quote from Mr. Keillor's Paper in the 1938 C.G.A. Proceedings: "If we had handy portable instruments which would make it possible to assess quickly the value of manufactured gas in terms of percentage efficiency when used in appliances instead of cubic feet delivered at the meter, this would probably be a more exacting method of evaluation and would soon supersede the calorific value test, just as the calorific value test supplanted the candle-power test twenty-two years ago. But we haven't got such instruments yet. The new type of Aeration Test Burner and research are assisting in this work." In his Paper in the 1941 C.G.A. Proceedings, Mr. Keillor repeated the need for calorific standards giving way to new measures of value.

A similar thought is expressed in the following quotation from the Paper by Shnidman and Yeaw in the 1940 A.G.A. Proceedings: "In conclusion, it is suggested that there is a need for some standardized test burner, so that correlated results may be obtained from a number of works plants and thus become of value to the Industry as a whole in the control of gas quality."

The above recommendations were made in peacetime; the war has intensified the need because of the enormous load increases necessitating substitute and auxiliary gases little dreamed of four years ago; any standardized test burner developed now would become our life-saver in the composition of the new era following the war. Give us the tools and we'll do the job expected of us.

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Gas Products Prices

The London Market Aug. 3.

The only change in the prices of Coal Tar Products in the London Market refers to 95/160 Solvent Naphtha, which is now about 2s. 3d. to 2s. 7d. per gallon.

The Provinces Aug. 3.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 10d., pure, 2s. 5d. (controlled by the Control of Toluene No. 2 Order, July 3, 1941, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 1s. to 1s. 4d. according to quality. Solvent naphtha, naked, North, 2s. 2d. to 2s. 6d. Heavy naphtha, North, 1s. 10d. to 1s. 11d. Carbolic acid, 60's, controlled by the Coal Tar Acids Prices (Inland) Order, 1942, operative from May 1. Naphthalene, controlled by the Naphthalene prices (Inland) Order, 1942, dated April 15, 1942, and operative from May 1, 1942, £19 to £19 10s.—bags free. Anthracene, controlled by the Anthracene Prices (Inland) Order, 1942, operative from May 1. Filtered heavy oil (min. gr. 1,080), 7¼d. to 8d. Creosote oil has been generally controlled as to direction and price for some time past. Current value—fuel grades 5d. to 5¼d; timber preservation and other purposes 4¾d. to 6d. These prices apply as from May 13.

*In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Tar Products in Scotland Aug. 1.

There is no change to record. Refined tar controlled. Value about 4½d. per gallon *ex* Works naked. Creosote oil: Specification oil, 6¾d. to 7d.; low gravity, 7¼d. to 7½d.; neutral oil, 6¾d. to 7d. per gallon; all *ex* Works in bulk. Cresylic acid is quite active with refined qualities controlled at 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha 6½d. to 7d. Solvent naphtha: 90/160 grade, 2s. to 2s. 3d. and 90/190 Heavy Naphtha 1s. 9d. to 2s. per gallon. Pyridine, 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

Gas Stocks and Shares

Idle conditions prevailed in most sections of the Stock Exchange last week although at the close there were signs of a slight increase in activity. The volume of business in the Gas Market, however, was about on a par with that of the previous week, and it will be seen that several stocks were marked up—East Surrey "B" being the most prominent with a rise of 10 to 82½—the last transaction recorded in this stock was as long ago as May, 1940, when it changed hands at 95½, and this scarcity of business since the stock is closely held has obviously militated against any earlier recovery in price. There were no changes in the Supplementary List. Owing to the holiday week-end it is not possible to pubiish the complete list of Stock and Share prices in this issue. These will appear next week.

The price changes during last week were:

OFFICIAL LIST

Bournemouth 4 p.c. Deb.	95—100	+5
Brighton Cons.	72—77	+2
Croydon Sliding Scale	97—102	+2
Ditto max. Div.	83—88	+1
East Surrey "B"	80—85	+10
Imperial Continental	63—68	+1
Ditto 3½ p.c. Red Deb. (x.d.)	90—95	July 27
Severn Valley Ord.	17/6—19/6	+-/6d.
South Metropolitan 6 p.c. Pref.	80—85	+2
South Suburban 5 p.c. Deb.	108—113	+1
United Kingdom Gas Corporation Ord.	15/6—17/6	+-/6d.

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Newcastle Units	20/6—21/-	--/3d.

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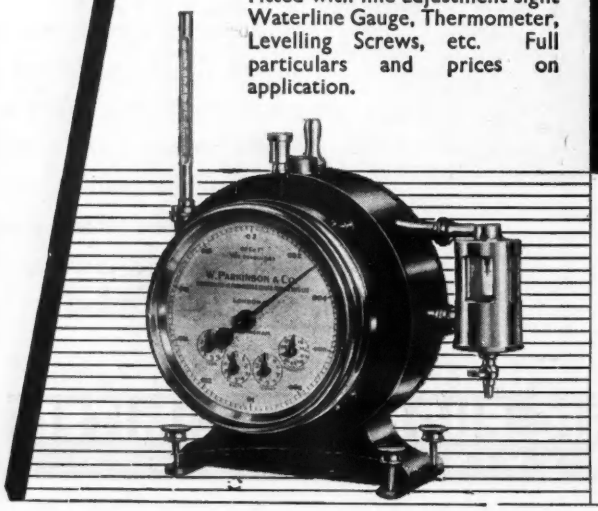

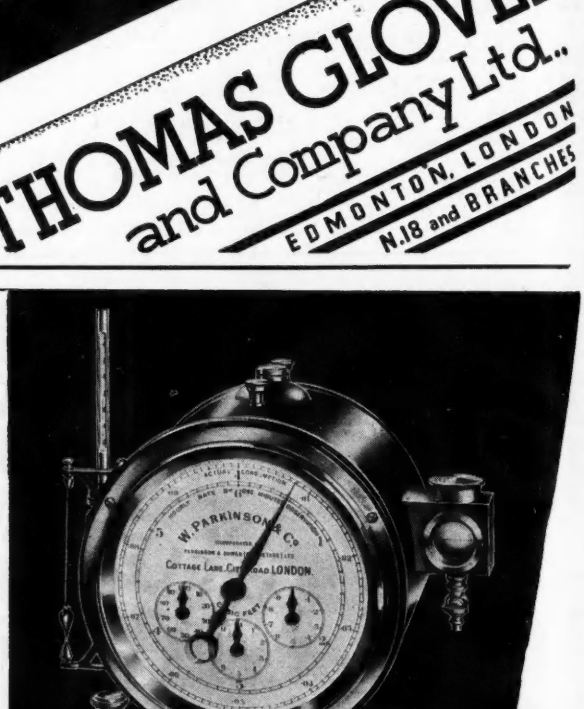

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